1. Optimizing The Use of Alginate

by International Journal

Submission date: 25-Apr-2020 07:45AM (UTC-0700)
Submission ID: 1307489665
File name: 1._Optimizing_The_Use_of_Alginate.docx (173.36K)
Word count: 1954
Character count: 9948

Optimizing The Use of Alginate from *Sargassum* and *Padina* as Natural Emulsifier and Stabilizer in Cake

ABSTRACT

Optimizing the use of alginate as a natural emulsifier and stabilizer in cake, using alginate of 6 types alginofit. Alginofit used were S. *crassifolium* (C), S. *polycystum* (O), *Padina* (N), S. *echinocarpum* (H), S. *duplicatum* (D) and S. *binderi* (B), which came from the rocky beach of Yogyakarta. This study used a randomized block design with 18 formulations with the treatment of 3 levels alginate: 0.5% (1), 0.75% (2) and 1% (3). Based on the experiment, to obtain good quality of cake, especially chocolate cake, should be added with 0,75% alginate from S. *duplicatum*. The cake of these experiment had composition of fat, water content, ash content and protein content were 18,98%; 19,67%; 2% and 63,1%. The content of Na and Ca were 51,04 ppm and 914,90 ppm.

Keywords: alginate, emulsifier, stabilizer, S. *duplicatum*, cake

INTRODUCTION

Alginate is the main content of the cell wall of brown seaweed or alginofit [1]. The use of alginate in the food industry related to the biophysical properties. Alginate is used as a thickener [2][3][4], so the product is more stable [5][6][7]. In addition, the alginate in the food industry are used to soften the texture of the cake, as well as stabilize the mixture, dispersion and emulsion related to its nature as a gelling agent and to increase the viscosity [8]. However, alginate which has been successfully extracted from the existing alginofit rocky coast of Yogyakarta, has never been utilized in this type of food.

Mushollaeni, (2004-2007) have developed a technique for extracting the brown seaweed from the area [9][10]. However, its use in food that can meet the specifications of the food industry and its biophysical properties of the chemical testing of alginate in the food, not yet known. Several studies have also not been much research on the testing of alginate and biophysical properties of the chemical in food, especially of the type of brown seaweed from rocky coast of Yogyakarta area. The potential use of seaweed is quite large and if explored further, it is expected that development will impact the application of these alginate in the food industry as well as to increase the local potential. *Sargassum* is a group of brown seaweeds and the leaves are shaped like knives. On the stalks contain the reproductive cells. *Sargassum* is brown or blonde, but the color will be slightly changed to bluish green when the dead drought. The size of the mass is higher than other types, which can reach three meters. *Padina* sp. is a kind of alginofit that looks like a pleated sheets and do not have the fine roots and also grow attached to the reefs in clearer waters [14].

Cake emulsifier is a substance that is used for cake batter stabilizer and softener. In the market, known by trade names such as ovalet, SP, Spontaneous 88, TBM and alginate. This will bring together the dough ingredients, so as to enhance the development of the cake, foam control, soften the texture and reduce the use of eggs [12][13][14]. Alginate can reduce crumb staling during storage [15]. In addition, a number of 0,25% -0,5% alginate can improve and stabilize the consistency of the contents of the baked products such as cake and pie. Some parameters that affect the success of seaweed extract properties as an emulsifier and stabilizer, the testing is done directly in food products as well as analyzed the physical properties of the chemical so that optimal use can be detected in food. Because of *Sargassum* and *Turbinaria* species found on rocky coasts of Yogyakarta area that has not been widely known about their use, although it has been successfully extracted and their chemical composition is known, then this study will reveal the optimal utilization in the food, especially in the cake.

MATERIALS AND METHODS

This research was conducted at the Laboratory of Process Engineering and Production Tribhuwana Tunggadewi University of Malang. Research aimed at optimizing the use of alginate as natural emulsifier and stabilizer on cake, using alginate of 6 types alginofit. Alginate obtained from 6 types alginofit from rocky beach area of Yogyakarta. This type of cake in this study is the type of chocolate cake. Indicator parameters including ash content, water content, fat content, protein content, and also natrium and calsium content. Composition of the use of materials in the production of cakes, based on the method of [12], were: refined sugar that is 22,43%; 20,5% egg yolk; 15.38% egg whites; 12,82% wheat flour; 6,4% cocoa powder; 3,2% of cornstarch and 19,23% liquid butter. Data analysis using analysis of variance of each parameter were observed.

Experimental design used was randomized block design with 18 cake formulation (R). This type of brown seaweed S. *crassifolium* (C), S. *polycystum* (O), *Padina* (N), S. *echinocarpum* (H), S. *duplicatum* (D) and S. *binderi* (B). Physical chemical analysis of the cake by AOAC methods (1990) includes the fat content (%) with Soxhlet, water content (%), ash content (%), protein content (%) by Kjeldahl, and mineral content of Na and Ca (ppm) using AAS. Analysis of levels of protein and mineral content of Na and Ca, carried out on the best physical chemical analysis of cake, obtained by analyzing the best treatment. Physical chemical analysis of cake, made to the requirements of SNI 01-3840-1995. The data obtained will be analyzed with analysis of variance and F test [16][17]. Determination of the best treatment, were analyzed using the method of Effectiveness Index [18][19].

RESULTS AND DISCUSSION

Water content

The average of cake's water content showed an increase with increasing the concentrations of alginate (Fig.1). The average of water content were 13.33% -22.33%.

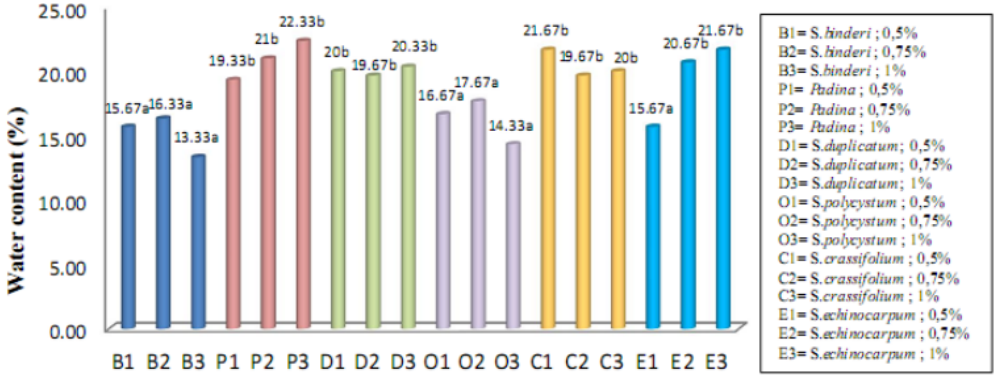

Fig. 1 The water content of cake with the application of alginate

Based on Figure 1, the addition of 1% of alginate from *Padina*, gave the highest water content (22.33%) and the addition of 1% of alginate from the type S. *binderi*, gave the lowest water content (13.33%). Alginate from *Padina* species, contributing to the increase in cake moisture content higher than other types. Alginate is a hydrophilic colloid. Colloidal properties, form a gel, and the hydrophilic cause alginate is widely used as an emulsifier, thickener, and stabilizer in the industry. Algin is a linear molecule with high molecular weight. This condition implies the algin, which is easy to absorb water. Higher water content in the sodium alginate due to the influence of salt is hygroscopic, which allows better water binding [20]. Therefore, with increasing the concentrations of sodium alginate, would increase the water content of the cake.

Components of the existing water in the cake, give effect to the final texture of the cake is gently inclined. The more low cake moisture content, the texture will be relatively harder than the higher levels of water. Adding the alginate from the type S. *binderi*, gave harder textured than the added alginate from *Padina*. Water binding

properties of alginate very well could produce a smooth texture and soft on the cake, to maintain texture and prevent hardening and brittleness of the food (Yunizal, 2004). The amount of water content and the incidence of migration of water in cake and bread, may be the cause of staling. Alginate can reduce crumb staling during storage [15]. In addition, a number of 0,25% -0,5% alginate can improve and stabilize the consistency of the contents of the baked products such as cake and pie. Based on SNI 01-3840-1995, cake moisture generated in standard bread still meet the maximum 40%.

Ash content

Ash is a component in food that is important to determine the mineral content. Based on the analysis of ash, shows the average of less than 3%. The average ash content ranged from 0,37%-2% (Fig. 2), so that the ash content of the resulting cake was meeting the standard SNI 01-3840-1995 that is maximum of 3%.

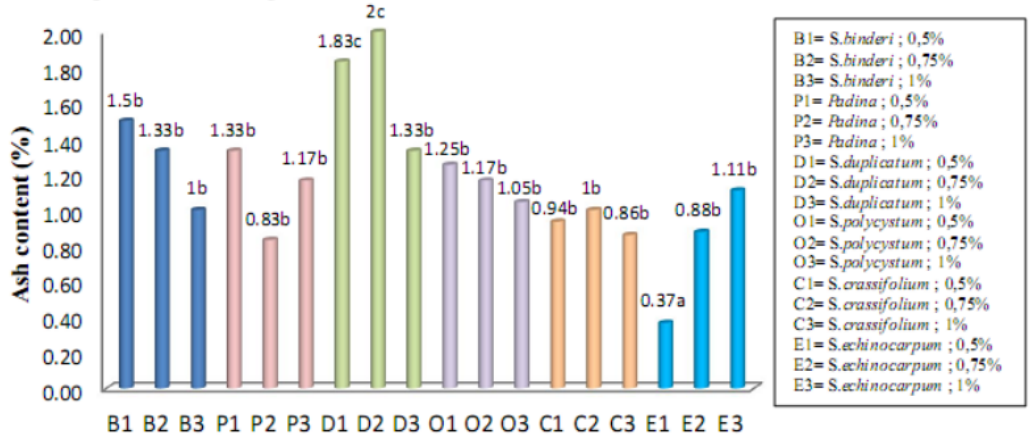

Fig. 2 The ash content of cake with the application of alginate

The results showed an effect of ash content of cake by adding variety and type of alginates from six brown seaweed. The addition of sodium alginate on the white bread is a very real influence of the ash content of white bread [21]. So that the ash content contained in alginate, effect on ash cake. The ash content of the six types of alginate brown seaweed used in the study is 18,20%-28,59% [22].

The ash content of sodium alginate showed the existence of mineral salts. Differences in ash content of each type of seaweed, showed a difference in the amount of mineral salts on the surface and it contains seaweed. Ash content of this mineral, most are generally the composition of halogen compounds (Br and I), as well as sodium and chlorine compounds in relatively low amounts [23][24]. The seaweed calcium levels are generally about 4-7% of dry weight or about 4000-7000 mg/100 g dry weight [25].

Fat content

The average levels of fats in cake were 11,72% -19,65% (Fig. 3). The highest fat content of cakes, obtained by the addition of alginate from the type S. *duplicatum* (16%) and the lowest came from alginate type S. *crassifolium* (13%). Increased fat content is influenced by the addition of alginate from brown seaweed species are different, possible because there are differences in the fat content of each of these types of brown seaweed. The chemical compounds are most abundant in the brown seaweed alginate, followed by carbohydrates, protein, fat, crude fiber, vitamins, anti-bacterial substances, minerals, etc., in a certain amount [20]. In addition there are other chemical compounds in relatively small quantities, such as laminaran, fukoidin, cellulose, manitol and bioactive compounds, and others. Seaweeds contain very little fat. Seaweed and plants in general store food reserves in the form of carbohydrates, especially polysaccharides [26]. Fat content in brown seaweed species *Sargassum* sp., According to a study of Handayani *et al* was 1,63% with the composition of fatty acids include lauric acid (12:0) 1,45%, myristic acid (14:0) 3,53% ; palmitic acid (16:0) 29,49%, palmitoleic acid (16:1) 4,10%, oleic acid (18:1) 13,78%, linoleic acid (18:2) 33,58% and the acid linolenic (18:3) 5,94% [27].

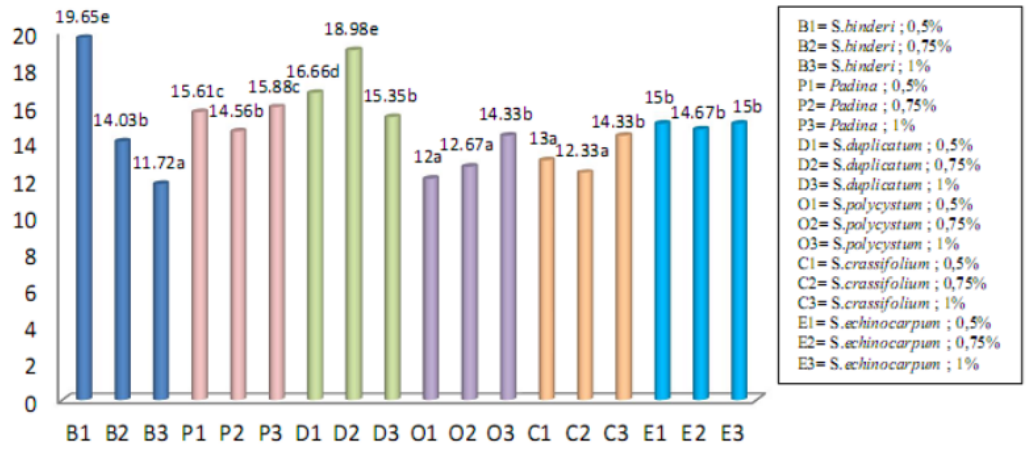

Fig. 3 The fat content of cake with the application of alginate

Alginate has byproduct it was propylene glycol alginate. It has a hydraulic and lipophilic groups. This allows the state to function as an emulsifier algin original with strong thickening properties. So with the addition of alginate concentration, can affect the total fat in the cake.

CONCLUSION

Analysis of the best treatment of all physical and chemical parameters of cake, showed that the best formulation to produce a cake that apply alginate derived from brown seaweed on the rocky coast of Yogyakarta as an emulsifier and stabilizer, was the use of alginate from S. *duplicatum* with the addition of as much as 0,75%. Alginate is a hydrophilic colloid, so if the cake use alginat with a higher concentration of 0.75%, will produce a cake with a physically more watery. In the same condition, if using alginate from *Padina* and S. *echinocarpum*. Alginate from S. *duplicatum* has water binding properties better than the other types, so it will produce a cake with smooth texture, can maintain the texture and prevent cake hardening. Based on this analysis of the best treatment, followed by analysis of protein content and mineral content of Na and Ca. The best use of alginate formulations of this cake, resulting in fat content of the cake was 18,98%; 19.67% water content was 19,67%; ash content was 2%; protein content was 63.1%; levels of Na was 51,04 ppm and Ca levels was 914,90 ppm.

ACNOWLEDGEMENT

This work was supported by Directorate of Research and Community Service, Kopertis 7, East Java Republic of Indonesia. Contract Number: 0614/023-04.2.01/15/2012; December 9, 2011

1. Optimizing The Use of Alginate

ORIGINALITY REPORT

16%	15%	3%	2%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	www.usa-journals.com Internet Source	7%
2	www.vaishnodevicollege.com Internet Source	3%
3	ajouronline.com Internet Source	3%
4	meuniernyc.com Internet Source	1%
5	naturalfoodadditives.org Internet Source	1%
6	Maya Puspita, Nur Azmi Ratna Setyawidati, Valérie Stiger-Pouvreau, Laurent Vandanjon et al. "Indonesian Sargassum species bioprospecting: potential applications of bioactive compounds and challenge for sustainable development", Elsevier BV, 2020 Publication	1%
7	Hongjun Lin, Meijia Zhang, Fangyuan Wang, Yiming He, Jianrong Chen, Huachang Hong,	<1%

Aijun Wang, Haiying Yu. "Experimental evidence for osmotic pressure-induced fouling in a membrane bioreactor", Bioresource Technology, 2014

Publication

Exclude quotes	Off	Exclude matches	Off
Exclude bibliography	Off		